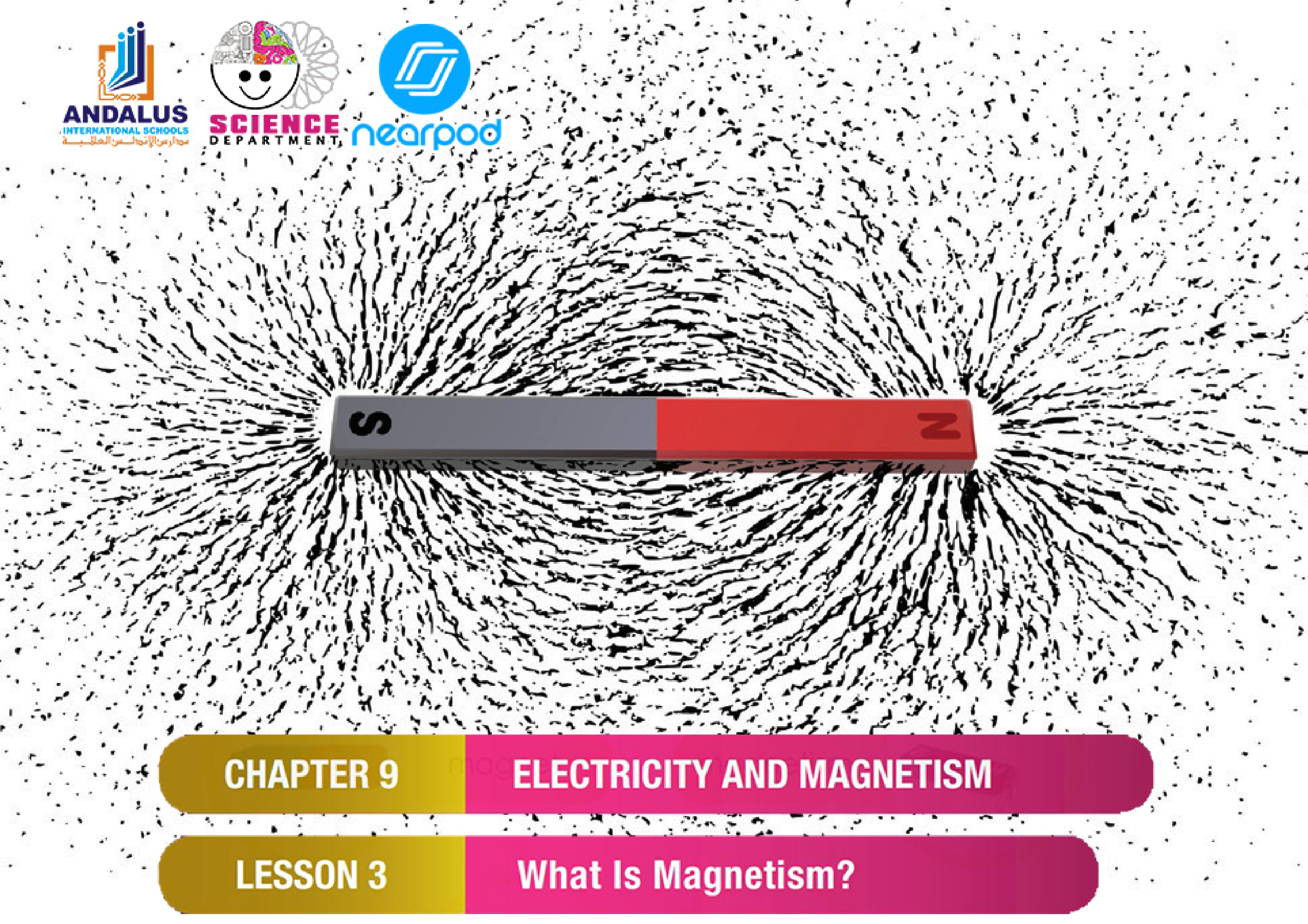
ANDALUS INTERNATIONAL SCHOOLS
مدارس الأندلس العالمية

SCIENCE DEPARTMENT

nearpod



CHAPTER 9 ELECTRICITY AND MAGNETISM

LESSON 3 What Is Magnetism?

3 What Is Magnetism?

Page 619

WARM-UP QUESTION

What holds these magnets to the refrigerator?

3 What Is Magnetism?

Page 619

WARM-UP QUESTION

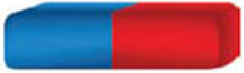
What holds these magnets to the refrigerator?

A force between the magnet and the metal

3 What Is Magnetism?

Page 619

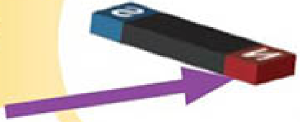
VOCABULARY

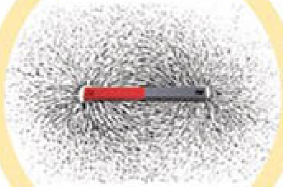


magnet

magnetism

magnetic pole





magnetic field

DIRECTED PRACTICE

MATERIALS

two bar magnets

Poles of Magnets

Page 620

Ask a question:

How do magnets interact?

DIRECTED PRACTICE

MATERIALS

two bar magnets

① Put the north pole of one magnet near the south pole of the other magnet. **Observe** What happens? **Record your observations.**

DIRECTED PRACTICE

MATERIALS

two bar magnets

1 Put the north pole of one magnet near the south pole of the other magnet. **Observe** What happens? **Record your observations.**

The magnets are attracted to each other.

2 Put the north pole of one magnet near the north pole of the other magnet. **Observe** what happens. **Record your observations.**

____

____

3 Put the south pole of one magnet near the south pole of the other magnet. **Observe** what happens. **Record your observations.**

____

____

② Put the north pole of one magnet near the north pole of the other magnet. **Observe** what happens. **Record your observations.**

The magnets repel each other.

③ Put the south pole of one magnet near the south pole of the other magnet. **Observe** what happens. **Record your observations.**

2 Put the north pole of one magnet near the north pole of the other magnet. **Observe** what happens. **Record your observations.**

The magnets repel each other.

3 Put the south pole of one magnet near the south pole of the other magnet. **Observe** what happens. **Record your observations.**

The magnets repel each other.

4 **Draw a conclusion.**
How do magnets interact?

____

____

5 Write a question that you can ask about the experiment. Then answer it.

____

____

④ **Draw a conclusion.**
How do magnets interact?

Different poles attract each other and like poles repel each other.

⑤ Write a question that you can ask about the experiment. Then answer it.

④ **Draw a conclusion.**
How do magnets interact?

Different poles attract each other and like poles repel each other.

⑤ Write a question that you can ask about the experiment. Then answer it.

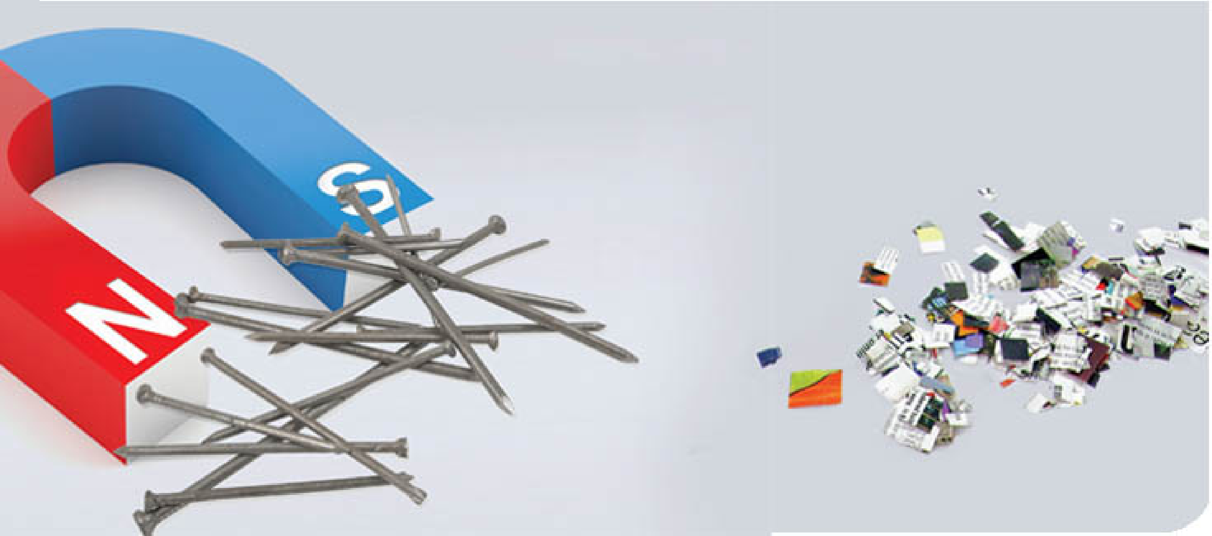
What pole of a magnet can attract the north pole of another magnet?

The south pole.

MAGNETS

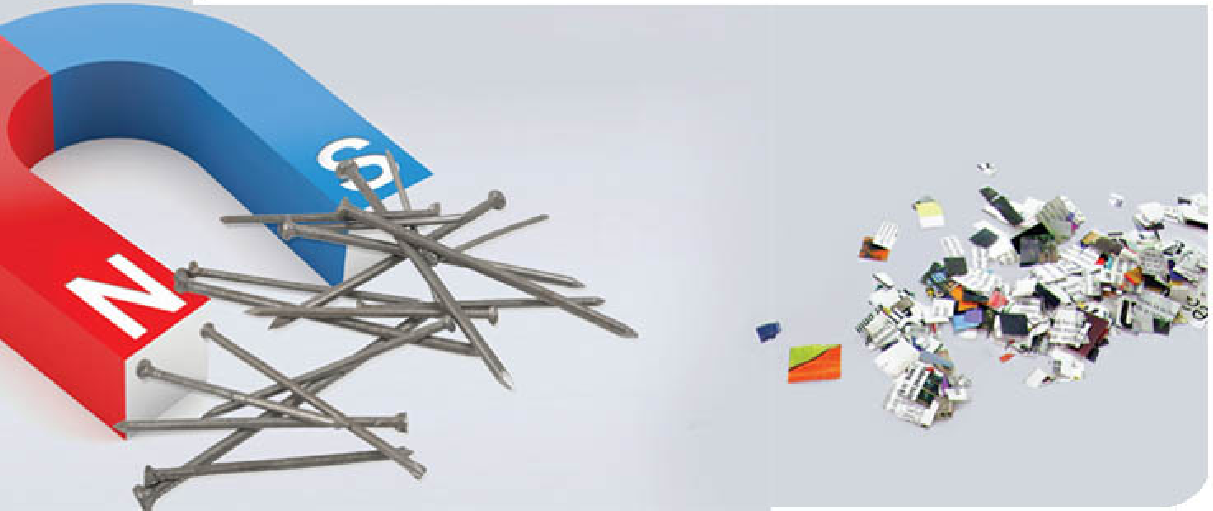
You use magnets every day. Magnets are a part of headphones, computers, doorbells, and other devices. A **magnet** is an object that attracts objects that contain iron. Magnets attract steel because it contains iron. What happens if you place a magnet near a soda can? Soda cans are made of aluminum, so magnets are not attracted to the cans because aluminum has no iron in it.

Magnets have the property of magnetism. **Magnetism** is a noncontact force that pulls on objects that contain iron. Magnets attract objects that contain iron, and they attract or repel other magnets.



Create Read the text. Ask a question about the text and then answer it.

Infer Look at the picture. Why are the pieces of paper not attracted to the magnet?



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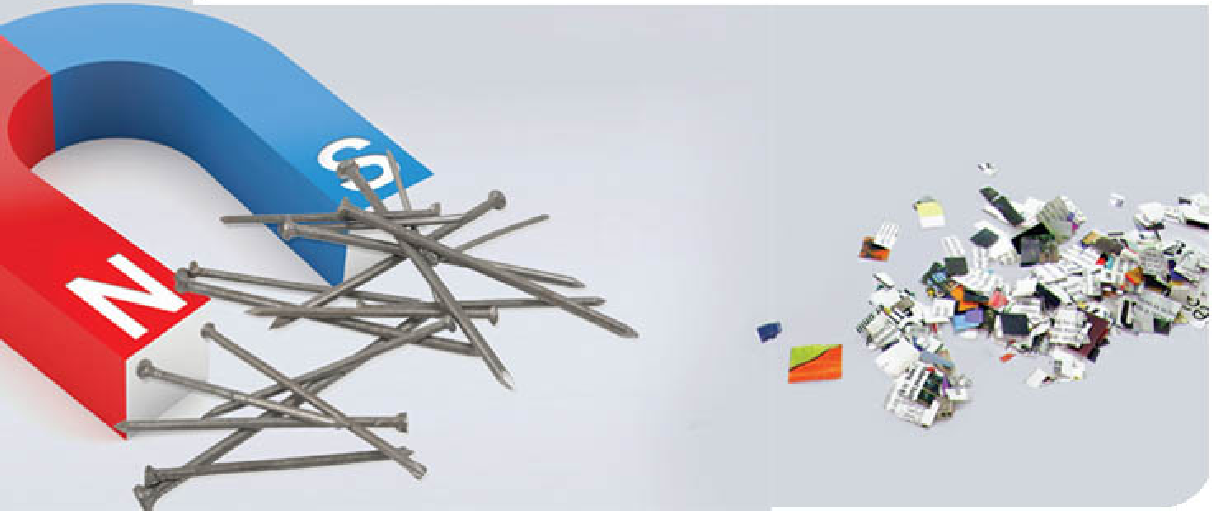
Create Read the text. Ask a question about the text and then answer it.

What is magnetism?

Magnetism is a noncontact force that pulls on objects that contain iron.

Infer Look at the picture. Why are the pieces of paper not attracted to the magnet?



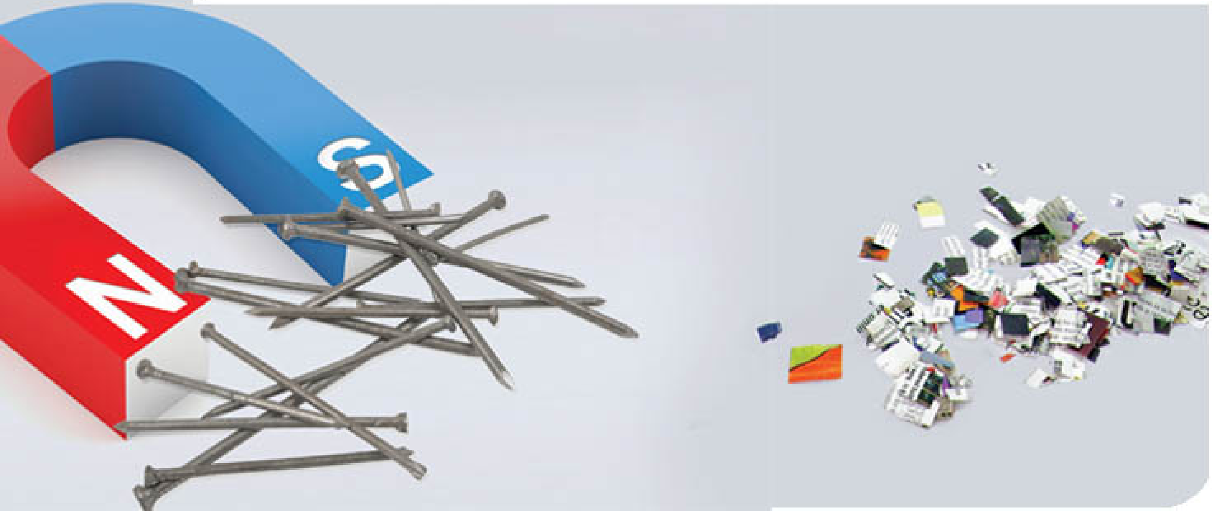
Create Read the text. Ask a question about the text and then answer it.

What is magnetism?

Magnetism is a noncontact force that pulls on objects that contain iron.

Infer Look at the picture. Why are the pieces of paper not attracted to the magnet?

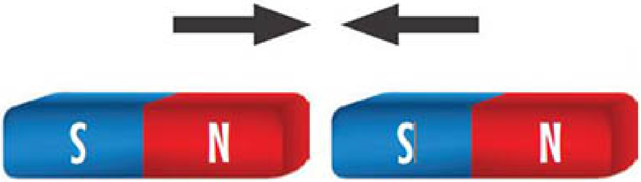
Because paper does not contain iron.

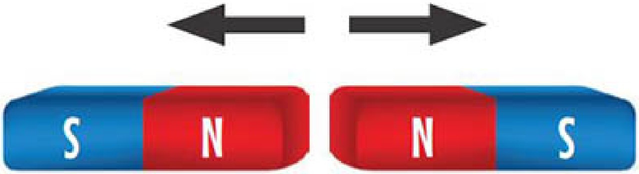


Magnetic Poles

All magnets have two ends called magnetic poles. A **magnetic pole** is the part of the magnet that has the strongest push or pull. One is a north-seeking (N) pole and the other is a south-seeking (S) pole.

Poles of a magnet exert forces on poles of other magnets. Opposite poles attract each other. The north pole of a magnet attracts the south pole of another magnet. Like poles repel each other. The north pole of a magnet repels the north pole of another magnet.





Analyze Label each picture. Write attract or repel.

Sequence Write the steps you can follow to identify the poles of a ring magnet.

____

____

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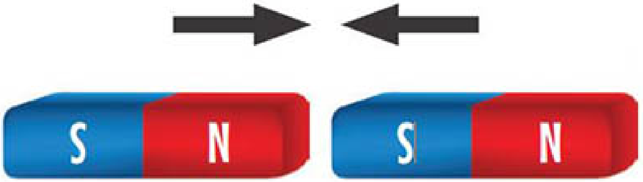
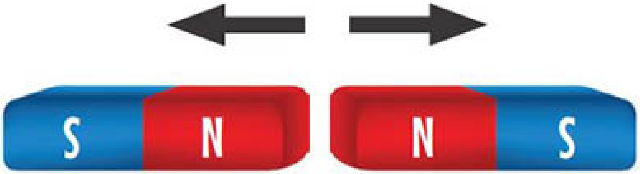


Attract



Repel

Analyze Label each picture. Write attract or repel.

Sequence Write the steps you can follow to identify the poles of a ring magnet.

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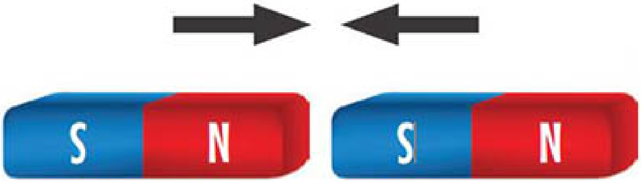
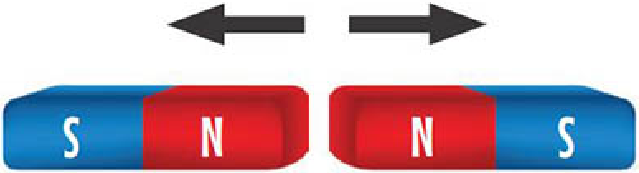


Attract



Repel

Analyze Label each picture. Write attract or repel.

Sequence Write the steps you can follow to identify the poles of a ring magnet.

First, I will get a ring magnet and a bar magnet. Then, I will hold the N facing pole of the bar magnet near the ring magnet.

Last, I will observe what happens. If the magnets attract each other, the pole of the ring magnet facing the bar magnet is the S pole. If the magnets repel each other, the pole of the ring magnet facing the bar magnet is the N pole.

The force that pushes magnets away from each other or pulls them together is called the magnetic force. The magnetic force between two magnets is affected by the distance between them. When two magnets are far apart, the magnetic force between them is weak. When two magnets are close together, the magnetic force between them is stronger.

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If a magnet and an object that a magnet can attract are far apart, the pull of the magnet is weak. As you bring the magnet closer to the object, the pull of the magnet is stronger.

Cause and Effect **Why are the paper clips not attracted to the magnet?**

Page 625

If a magnet and an object that a magnet can attract are far apart, the pull of the magnet is weak. As you bring the magnet closer to the object, the pull of the magnet is stronger.

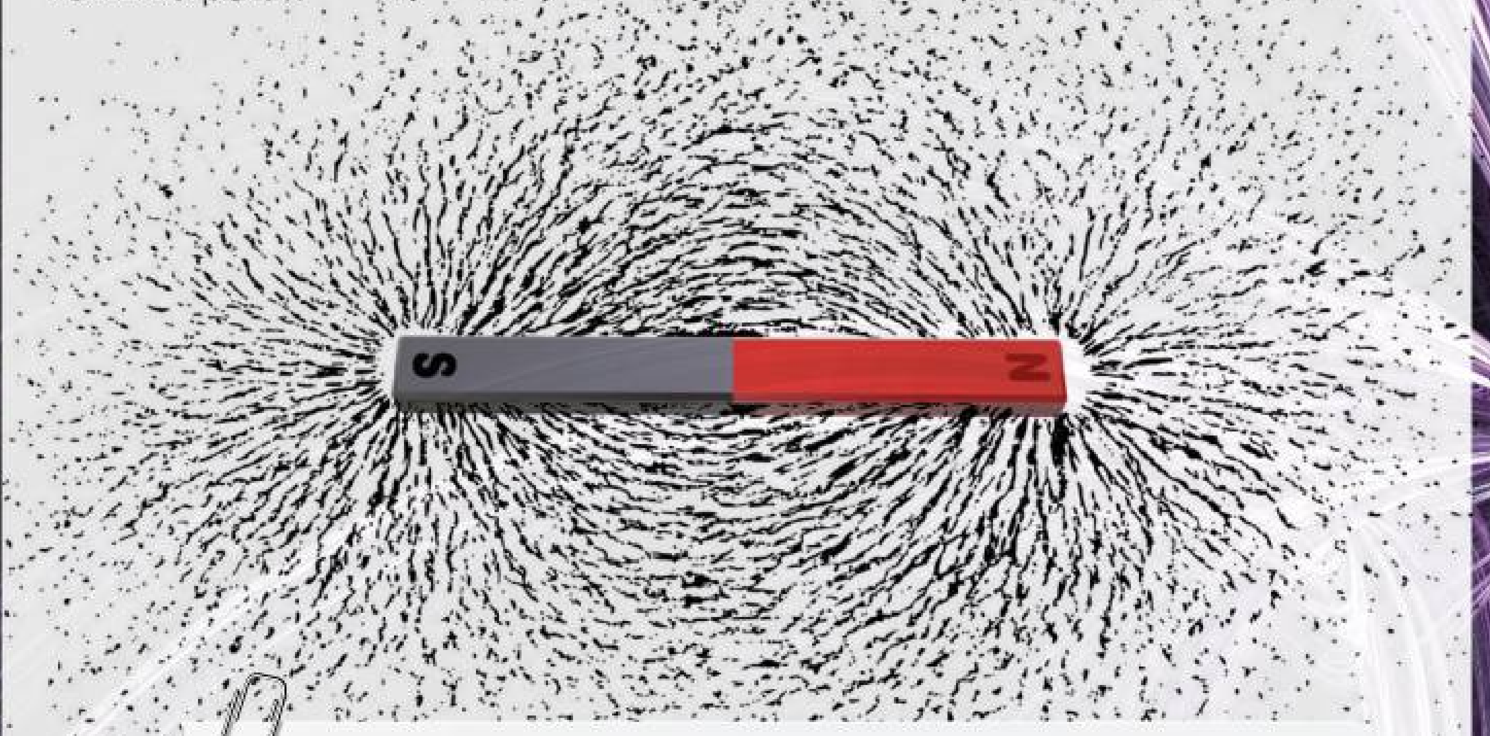
Cause and Effect Why are the paper clips not attracted to the magnet?

The paper clips are not attracted to the magnet because they are far apart.

Magnetic Field

When you push a cart, you have to touch it. How do magnets attract iron objects without touching them? How do magnets attract or repel other magnets without touching each other?

Magnets are surrounded by a magnetic field. A **magnetic field** is the space around a magnet in which the force of a magnet can act. You cannot see the magnetic field, but you can see its effect when it causes objects to move. The magnetic field is strongest near the poles of magnets and gets weaker away from the poles.



The iron filings make lines. These lines show the magnetic field. The magnetic field lines are close together at the poles of the magnets where the magnetic field is strongest.

Identify Circle the parts of the magnet where the magnetic field is strongest.

Magnetic Field

When you push a cart, you have to touch it. How do magnets attract iron objects without touching them? How do magnets attract or repel other magnets without touching each other?

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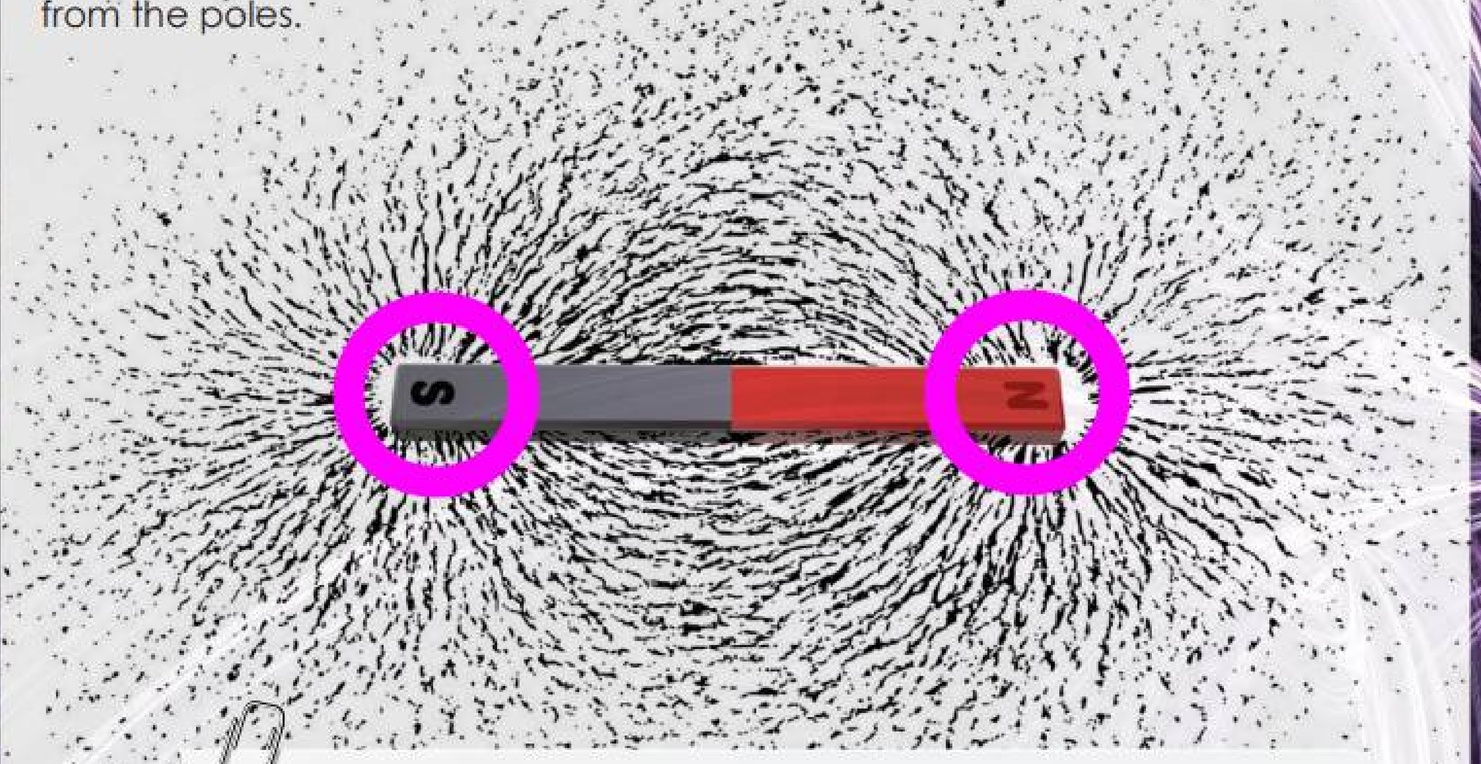


The iron filings make lines. These lines show the magnetic field. The magnetic field lines are close together at the poles of the magnets where the magnetic field is strongest.

Identify Circle the parts of the magnet where the magnetic field is strongest.

Magnet and Matter

Magnets can attract or pull on objects that contain iron through air, water, and some solids.

The horseshoe magnet pulls on the paper clip because it contains iron. The horseshoe magnet pulls the paper clip through air.

The horseshoe magnet pulls on the paper clip through plastic.

The horseshoe magnet pulls on the paper clip through water.

Conclude **What can a magnetic force pass through?** ______________________

Magnet and Matter

Magnets can attract or pull on objects that contain iron through air, water, and some solids.

Page
627

The horseshoe magnet pulls on the paper clip because it contains iron. The horseshoe magnet pulls the paper clip through air.

The horseshoe magnet pulls on the paper clip through plastic.

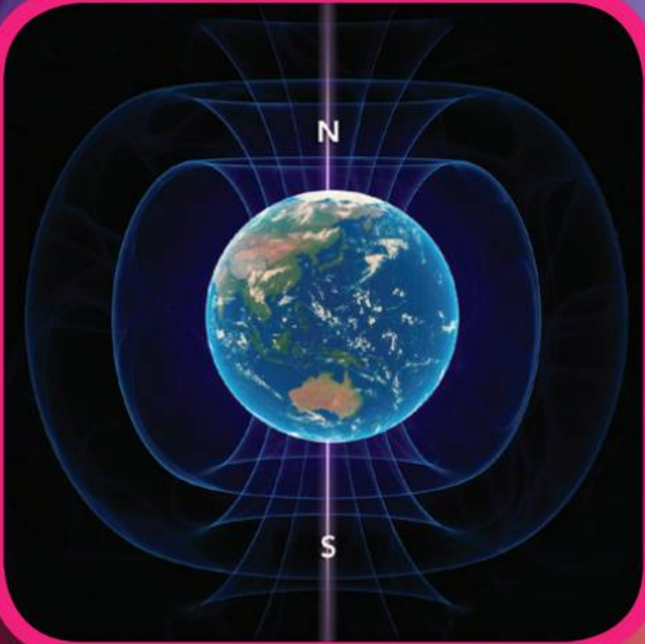
The horseshoe magnet pulls on the paper clip through water.

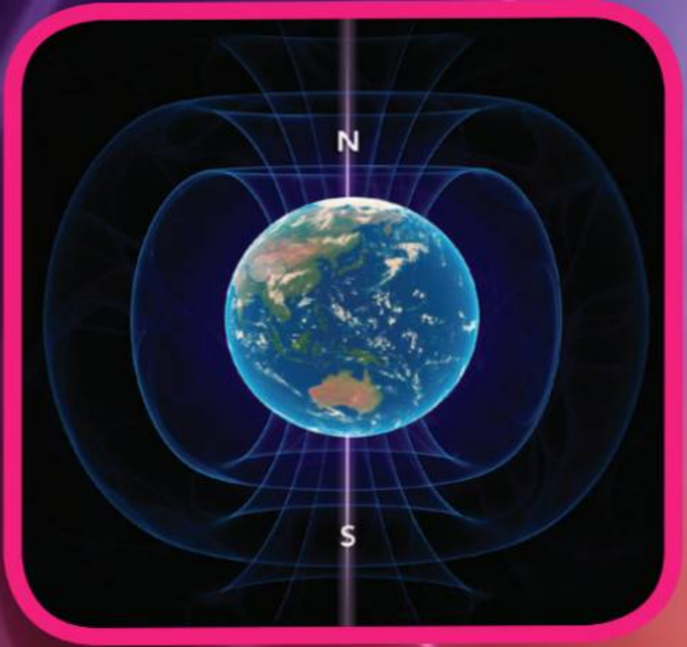
Conclude What can a magnetic force pass through? air, water, and some solids

Magnetic Field of Earth

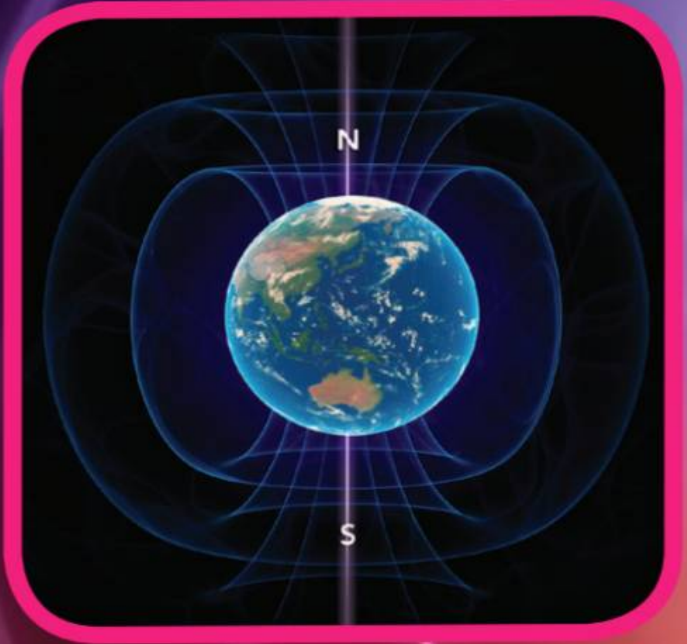
The core of our planet Earth is divided into the outer core and the inner core. The outer core is made mostly of hot liquid iron. The movement of this iron produces a magnetic field that surrounds Earth. Earth acts like a big magnet. Like all magnets, it has a North Pole and a South Pole.

Compasses help people determine directions. The needle inside the compass is a magnet that points to the North Pole of Earth.





Explain Why does Earth act like a magnet?



Explain Why does Earth act like a magnet?

Earth acts like a magnet because its outer core is made of hot molten iron. This iron creates a magnetic field that surrounds Earth. Like all magnets, it has a north pole and a south pole.

APPLY MATH

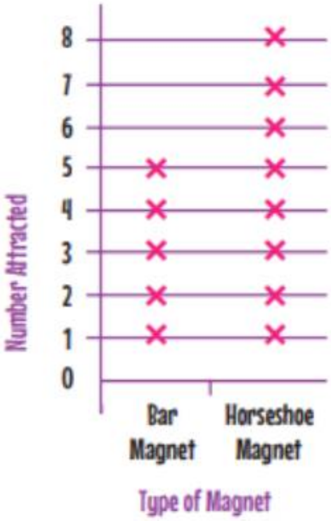
Reading Line Plots

Math Skill

Line plots show the frequency of data on a number line.

Apply Math

The following line plots show the number of paper clips picked up by a bar magnet and a horseshoe magnet.



How many paper clips are picked up by the horseshoe magnet?

____

How many paper clips are picked up by the bar magnet?

____

Which magnet is stronger?

____

APPLY MATH

Reading Line Plots

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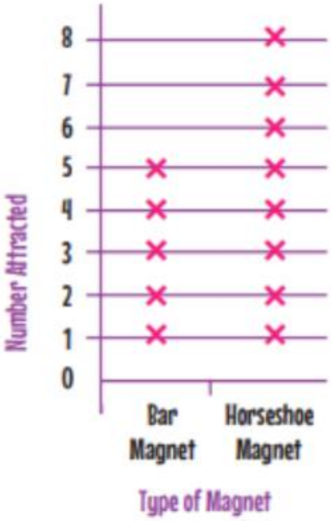
Math Skill

Line plots show the frequency of data on a number line.

Apply Math

The following line plots show the number of paper clips picked up by a bar magnet and a horseshoe magnet.



How many paper clips are picked up by the horseshoe magnet?

8 paper clips

How many paper clips are picked up by the bar magnet?

5 paper clips

Which magnet is stronger?

Is stronger.

WORLD CONNECTION

Maglev Trains

Have you ever seen a train without wheels?

Robert Goddard and a few other scientists invented the maglev train. Maglev is shortened from magnetic levitation. Levitation means to float. Maglev trains can travel faster than 300 miles (482 kilometers) per hour. This is because they float over a track and move by the force of magnets. The cars of the train are suspended in air above a single track. They move forward using the positive and negative forces of magnetism. There is no friction to slow the train cars down. Maglevs are quieter and consume less energy than ordinary trains.

Explain **Why are maglev trains so fast?**

____

____

____

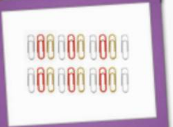
GUIDED PRACTICE

MATERIALS

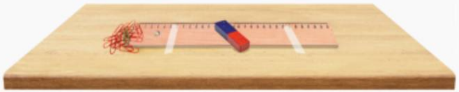
tape

ruler

bar magnet


20 paper clips

Magnetic Force and Distance



Ask a question: How does distance affect magnetic force?

1. Tape the ruler on to a table. Put the paper clips next to the 0-centimeter mark on the ruler.
2. Put one end of the bar magnet next to the 12-centimeter mark on the ruler.
3. **Observe** if the paper clips move toward the magnet. Count the paper clips that are pulled toward the magnet. **Record your observations.**
4. Move the end of the bar magnet from the 12-centimeter mark to the 10-centimeter mark on the ruler. Repeat Step 3.
5. Repeat Steps 2 and 3 by moving the end of the bar magnet next to the following marks on the ruler: 8 centimeters, 6 centimeters, 4 centimeters, 2 centimeters, and 0 centimeters.

Distance (cm)	Number of Paper Clips
12	
10	
8	
6	
4	
2	
0	

6. **Draw a conclusion.**
How does distance affect magnetic force?

____

____

____

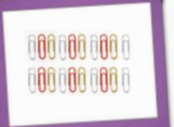
____

MATERIALS

tape

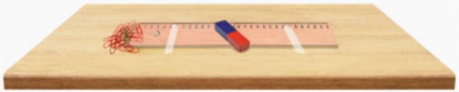
ruler

bar magnet



20 paper clips

Magnetic Force and Distance



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5. Repeat Steps 2 and 3 by moving the end of the bar magnet next to the following marks on the ruler: 8 centimeters, 6 centimeters, 4 centimeters, 2 centimeters, and 0 centimeters.

Distance (cm)	Number of Paper Clips
12	
10	
8	
6	
4	
2	
0	

6. **Draw a conclusion.**
How does distance affect magnetic force?

As the distance between the magnet and the paper clips increases, the strength of the magnetic force decreases.

LESSON REVIEW

① Vocabulary

Fill in the space.

______________________ is a noncontact force that pulls on objects that contain iron.

② Identify

Circle the correct answer.

Magnets pull on objects that ______________________

ⓐ contain plastic.

ⓑ contain wood.

ⓒ contain iron.

ⓓ all the previous answers

③ Apply

Draw something a magnet can attract.

LESSON REVIEW

① **Vocabulary**

Fill in the space.

Magnetism is a noncontact force that pulls on objects that contain iron.

② **Identify**

Circle the correct answer.

Magnets pull on objects that ____________________

- ⓐ contain plastic.
- ⓑ contain wood.
- ⓒ contain iron.
- ⓓ all the previous answers

③ **Apply**

Draw something a magnet can attract.

LESSON REVIEW

① **Vocabulary**

Fill in the space.

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② **Identify**

Circle the correct answer.

Magnets pull on objects that ____________________

- ⓐ contain plastic.
- ⓑ contain wood.
- [✓ ⓒ contain iron.]
- ⓓ all the previous answers

③ **Apply**

Draw something a magnet can attract.

LESSON REVIEW

Page 634

① Vocabulary

Fill in the space.

Magnetism is a noncontact force that pulls on objects that contain iron.

② Identify

Circle the correct answer.

Magnets pull on objects that ______________________

ⓐ contain plastic.

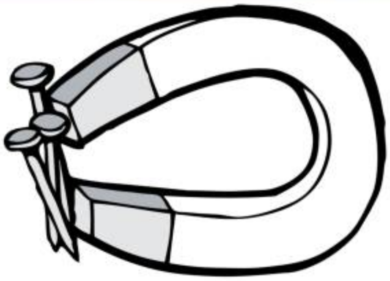
ⓑ contain wood.

[✓ ⓒ contain iron.]

ⓓ all the previous answers

③ Apply

Draw something a magnet can attract.



④ **Evaluate**

Do you think gravity and magnetism are alike? Why?

⑤ **Sequence**

Suppose that you have a mixture of iron filings and sand. Write the steps you need to carry out to separate the iron filings from the sand.

④ **Evaluate**

Do you think gravity and magnetism are alike? Why?

Yes, they are alike. Both are non-contact forces.

⑤ **Sequence**

Suppose that you have a mixture of iron filings and sand. Write the steps you need to carry out to separate the iron filings from the sand.

④ Evaluate

Do you think gravity and magnetism are alike? Why?

Yes, they are alike.
Both are non-contact
forces.

⑤ Sequence

Suppose that you have a mixture of iron filings and sand. Write the steps you need to carry out to separate the iron filings from the sand.

First, I will get a magnet.
Next, I will hold the magnet
near the sand-iron mixture.
Last, the iron filings will be
attracted to the magnet,
leaving the sand behind.

Name ____________________

Date ____________________

Vocabulary

1 **Use** the clues to fill in the following puzzle.

Across

1. an object that attracts iron
3. A magnet has two ends called magnetic poles.

Down

1. noncontact force that pulls on objects that contain iron
2. The space around the magnet is called the magnetic field.

				1 m	A	G	n	E	T
				A					
				G					
				n					
		2 F		E					
		I		T					
		E		I					
3 P	O	L	E	S					
		D		m					

Understand

2 **Explain:**

a. Why do magnets attract nails?

because nails contain iron

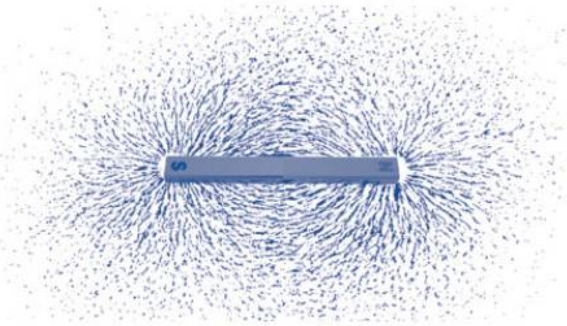
b. Why does a compass have a magnetic needle?

because the needle is attracted to magnetic poles of

the Earth, which will show the direction of North

Apply Concepts

3 How do you know that
this metal is a magnet?



because it attracts the iron filings.